

**Listing of Claims**

1        1. (Original) A method of processing a plurality of keep-alive messages generated by  
2        a corresponding plurality of end systems, each of said plurality of keep-alive messages being  
3        designed to request the status of a corresponding point to point (PPP) session implemented  
4        on a communication network, said method comprising:

5              receiving in an aggregation device said plurality of keep-alive messages;

6              generating in said aggregation device an aggregated request packet which indicates  
7        that the status of said PPP sessions is requested; and

8              sending said aggregated request packet on said communication network to a peer  
9        aggregation device.

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1        2. (Original) The method of claim 1, further comprising:

2              receiving said aggregated request packet in said peer aggregation device;

3              indicating the status of said plurality of sessions in an aggregated reply packet; and  
4              sending said aggregated reply packet to said aggregation device.

1        3. (Original) The method of claim 1, further comprising receiving in said aggregation  
2        device an aggregated reply packet from said peer aggregation device, wherein said  
3        aggregated reply packet indicates the status of at least some of said plurality of PPP sessions.

1        4. (Original) The method of claim 3, further comprising sending a proxy keep-alive  
2        reply message to one of said plurality of end systems originating a corresponding one of said  
3        keep alive-messages without waiting for said aggregated reply packet.

1        5. (Original) The method of claim 4, further comprising:

2              maintaining a remote status table in said aggregation device, wherein said remote  
3        status table indicates the status of sessions supported by said aggregation device;

4 updating said remote status table with the information in said aggregated reply packet;

5 and

6 generating said proxy keep-alive reply according to said remote status table.

1 6. (Original) The method of claim 5, wherein said proxy keep-alive message indicates  
2 that the corresponding session is alive/OK when a first keep-alive message is received for the  
3 corresponding session.

1 7. (Original) The method of claim 6, further comprising initializing the status of each  
2 of said session to alive/OK such that said proxy keep-alive message in response to said first  
3 keep-alive message indicates alive/OK status.

1 A12 8. (Original) The method of claim 1, wherein said communication network is  
2 implemented using one of frame relay, ATM and IP networks.

1 9. (Original) The method of claim 1, wherein said aggregation device is one of a  
2 network access server and home gateway.

1 10. (Original) A method of processing an aggregated request packet in an aggregation  
2 device, wherein said aggregated request packet indicates that the status of a plurality of point-  
3 to-point sessions are requested, said method comprising:

4 examining said aggregated request packet to determine said plurality of point-to-point  
5 sessions;

6 determining the status of each of said plurality of point-to-point sessions;

7 generating an aggregated reply packet indicating the status of said plurality of point-  
8 to-point sessions; and

9 sending said aggregated reply packet to said peer aggregation device.

1        11. (Original) The method of claim 10, wherein said determining comprises accessing  
2        a local status table which contains the status information of at least some of said plurality of  
3        point-to-point sessions.

1        12. (Original) The method of claim 10, wherein said generating comprises including  
2        a client magic number associated with each of said plurality of point-to-point sessions.

1        13. (Original) The method of claim 10, wherein said generating comprises setting a  
2        bit to one logical value to indicate that a corresponding one of said plurality of sessions is  
3        OK/alive, and to another logical value to indicate that said corresponding one of said plurality  
4        of session not OK/alive.

1        14. (Original) The method of claim 10, wherein said aggregation device comprises  
2        one of a network access server (NAS) and a home gateway implemented in a communication  
3        network.

1        15. (Original) An aggregation device for processing a plurality of keep-alive messages  
2        generated by a corresponding plurality of end systems, each of said plurality of keep-alive  
3        messages being designed to request the status of a corresponding point to point (PPP) session  
4        implemented on a communication network, said aggregation device comprising:

5              an input interface receiving said plurality of keep-alive messages;

6              a message aggregator coupled to said input interface, said message aggregator  
7        examining said plurality of message and generating data according to a format indicating that  
8        the status of said PPP sessions is requested; and

9              an output interface sending an aggregated request packet on said communication  
10      network to a peer aggregation device, said aggregated request packet containing said data  
11      generated by said message aggregator.

1        16. (Original) The aggregation device of claim 15, further comprising an encapsulator  
2        encapsulating said data in a packet suitable for transmission on said communication network.

1        17. (Original) The aggregation device of claim 16, further comprising:  
2              a remote status table indicating the status of sessions supported by said aggregation  
3              device; and

4              a de-aggregator receiving an aggregated reply packet from said peer aggregation  
5              device, wherein said aggregated reply packet indicates the status of at least some of said  
6              plurality of PPP sessions, said de-aggregator updating said remote status table with the  
7              information in said aggregated reply packet.

A 12/1        18. (Original) The aggregation device of claim 17, further comprising a proxy reply  
2        unit sending a proxy keep-alive reply message to one of said plurality of end systems  
3        originating a corresponding one of said keep alive-messages without waiting for said  
4        aggregated reply packet.

1        19. (Original) The invention of claim 18, wherein said aggregation device comprises  
2        a network access server.

1        20. (Original) The aggregation device of claim 18, wherein said aggregated request  
2        packet contains a magic number related to each of the corresponding sessions.

1        21. (Original) An aggregation device for processing a plurality of keep-alive messages  
2        generated by a corresponding plurality of end systems, each of said plurality of keep-alive  
3        messages being designed to request the status of a corresponding point to point (PPP) session  
4        implemented on a communication network, said aggregation device comprising:  
5              first means for receiving said plurality of keep-alive messages;

6       means for generating an aggregated request packet which indicates that the status of  
7    said PPP sessions is requested; and

8       means for sending said aggregated request packet on said communication network to  
9    a peer aggregation device.

1       22. (Original) The aggregation device of claim 21, further comprising second means  
2    for receiving an aggregated reply packet from said peer aggregation device, wherein said  
3    aggregated reply packet indicates the status of at least some of said plurality of PPP sessions.

1       23. (Original) The aggregation device of claim 22, further comprising means for  
2    sending a proxy keep-alive reply message to one of said plurality of end systems originating  
3    a corresponding one of said keep alive-messages without waiting for said aggregated reply  
4    packet.

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1       24. (Original) The aggregation device of claim 23, further comprising:  
2       means for maintaining a remote status table in said aggregation device, wherein said  
3    remote status table indicates the status of sessions supported by said aggregation device;  
4       means for updating said remote status table with the information in said aggregated  
5    reply packet; and  
6       means for generating said proxy keep-alive reply according to said remote status table.

1       25. (Original) An aggregation device for processing an aggregated request packet,  
2    wherein said aggregated request packet indicates that the status of a plurality of point-to-point  
3    sessions are requested, said aggregation device comprising:

4       means for examining said aggregated request packet to determine said plurality of  
5    point-to-point sessions;  
6       means for determining the status of each of said plurality of point-to-point sessions;

7       means for generating an aggregated reply packet indicating the status of said plurality  
8       of point-to-point sessions; and

9       means for sending said aggregated reply packet to said peer aggregation device.

1       26. (Original) The aggregation device of claim 25, wherein said means for  
2       determining comprises means for accessing a local status table which contains the status  
3       information of at least some of said plurality of point-to-point sessions.

1       27. (Original) The aggregation device of claim 25, wherein said means for generating  
2       includes a client magic number associated with each of said plurality of point-to-point  
3       sessions.

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1       28. (Original) The aggregation device of claim 25, wherein said means for generating  
2       sets a bit in said aggregated reply packet to one logical value to indicate that a corresponding  
3       one of said plurality of sessions is OK/alive, and to another logical value to indicate that said  
4       corresponding one of said plurality of session not OK/alive.

1       29. (Original) The aggregation device of claim 25, wherein said aggregation device  
2       comprises one of a network access server (NAS) and a home gateway implemented in a  
3       communication network.

1       30. (Original) An aggregation device for processing an aggregated request packet,  
2       wherein said aggregated request packet indicates that the status of a plurality of point-to-point  
3       sessions are requested, said aggregation device comprising:

4           an input interface receiving said aggregated request packet;

5           a de-encapsulator examining said aggregated request packet to determine that said  
6       aggregated request packet relates to requesting the status of point-to-point sessions;

7        a reply generator determining the status of each of said plurality of point-to-point  
8        sessions, and generating an aggregated reply packet indicating the status of said plurality of  
9        point-to-point sessions; and

10        an output interface sending said aggregated reply packet to said peer aggregation  
11        device.

1        31. (Original) The aggregation device of claim 30, further comprising a local status  
2        table storing the status information of at least some of said plurality of point-to-point  
3        sessions, wherein said reply generator determines the status of said at least some of said  
4        plurality of point-to-point sessions by accessing said local status table.

1        32. (Original) The aggregation device of claim 31, further comprising a session  
2        manager updating the status of said plurality of point-to-point sessions in said local status  
3        table.

1        33. (Original) The aggregation device of claim 30, wherein said reply generator  
2        includes in said aggregated reply packet a client magic number associated with each of said  
3        plurality of point-to-point sessions.

1        34. (Original) The aggregation device of claim 30, wherein said reply generator sets  
2        a bit in said aggregated reply packet to one logical value to indicate that a corresponding one  
3        of said plurality of sessions is OK/alive, and to another logical value to indicate that said  
4        corresponding one of said plurality of session not OK/alive.

1        35. (Original) The aggregation device of claim 30, further comprising a keep-alive  
2        processor coupled to said de-encapsulator, wherein said keep-alive processor examines said  
3        aggregated request packet to determine that status of point-to-point sessions is requested and  
4        causes said reply generator to generate said aggregated reply packet.

1       36. (Original) The aggregation device of claim 30, wherein said aggregation device  
2 comprises one of a network access server (NAS) and a home gateway implemented in a  
3 communication network.

1       37. (Original) A computer-readable medium carrying one or more sequences of  
2 instructions for causing a aggregation device to process a plurality of keep-alive messages  
3 generated by a corresponding plurality of end systems, each of said plurality of keep-alive  
4 messages being designed to request the status of a corresponding point to point (PPP) session  
5 implemented on a communication network, wherein execution of said one or more sequences  
6 of instructions by one or more processors contained in said aggregation device causes said  
7 one or more processors to perform the actions of:

8             receiving in an aggregation device said plurality of keep-alive messages;  
9             generating in said aggregation device an aggregated request packet which indicates  
10          that the status of said PPP sessions is requested; and  
11             sending said aggregated request packet on said communication network to a peer  
12          aggregation device.

1       38. (Original) The computer-readable medium of claim 37, further comprising:  
2             receiving said aggregated request packet in said peer aggregation device;  
3             indicating the status of said plurality of sessions in an aggregated reply packet; and  
4             sending said aggregated reply packet to said aggregation device.

1       39. (Original) The computer-readable medium of claim 37, further comprising  
2             receiving in said aggregation device an aggregated reply packet from said peer aggregation  
3          device, wherein said aggregated reply packet indicates the status of at least some of said  
4          plurality of PPP sessions.

1       40. (Original) The computer-readable medium of claim 39, further comprising  
2 sending a proxy keep-alive reply message to one of said plurality of end systems originating  
3 a corresponding one of said keep alive-messages without waiting for said aggregated reply  
4 packet.

1       41. (Original) The computer-readable medium of claim 40, further comprising:  
2             maintaining a remote status table in said aggregation device, wherein said remote  
3 status table indicates the status of sessions supported by said aggregation device;  
4             updating said remote status table with the information in said aggregated reply packet;  
5 and  
6             generating said proxy keep-alive reply according to said remote status table.

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1       42. (Original) A computer-readable medium carrying one or more sequences of  
2 instructions for causing an aggregation device to process an aggregated request packet,  
3 wherein said aggregated request packet indicates that the status of a plurality of point-to-point  
4 sessions are requested, wherein execution of said one or more sequences of instructions by  
5 one or more processors contained in said aggregation device causes said one or more  
6 processors to perform the actions of:  
7             examining said aggregated request packet to determine said plurality of point-to-point  
8 sessions;  
9             determining the status of each of said plurality of point-to-point sessions;  
10          generating an aggregated reply packet indicating the status of said plurality of point-  
11 to-point sessions; and  
12          sending said aggregated reply packet to said peer aggregation device.

1       43. (Original) The computer-readable medium of claim 42, wherein said determining  
2 comprises accessing a local status table which contains the status information of at least some  
3 of said plurality of point-to-point sessions.

1        44. (Original) The computer-readable medium of claim 42, wherein said generating  
2 comprises including a client magic number associated with each of said plurality of point-to-  
3 point sessions.

1        45. (Original) The computer-readable medium of claim 42, wherein said generating  
2 comprises setting a bit to one logical value to indicate that a corresponding one of said  
3 plurality of sessions is OK/alive, and to another logical value to indicate that said  
4 corresponding one of said plurality of session not OK/alive.

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1        46. (Original) The computer-readable medium of claim 42, wherein said aggregation  
2 device comprises one of a network access server (NAS) and a home gateway implemented  
3 in a communication network.

1        47. (New) A communication network comprising:  
2              a first aggregation device receiving a plurality of keep-alive messages generated by  
3 a corresponding plurality of end systems, each of said plurality of keep-alive messages being  
4 designed to request the status of a corresponding point to point (PPP) session implemented  
5 on said communication network, said first aggregation device generating an aggregated  
6 request packet which indicates that the status of said PPP sessions is requested, and sending  
7 said aggregated request packet; and  
8              a peer aggregation device receiving said aggregated request packet and indicating the  
9 status of said plurality of sessions in an aggregated reply packet, said peer aggregation packet  
10 sending said aggregated reply packet to said first aggregation device.

1        48. (New) The communication network of claim 47, wherein said first aggregation  
2 device is located at an edge of said communication networks.

1        49. (New) The communication network of claim 48, further comprising an access  
2        network coupling said first aggregation device to said corresponding plurality of end systems,  
3        wherein said plurality of keep-alive messages are received on said access network.

1        50. (New) The communication network of claim 49, wherein said first aggregation  
2        device and said peer aggregation device respectively comprise a network access server (NAS)  
3        and a home gateway.

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